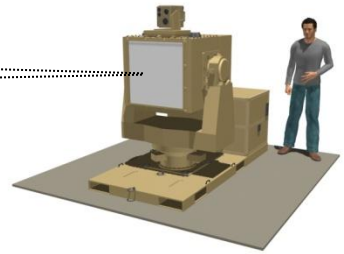
Unclassified

Solid State Active Denial Technology (SS-ADT)

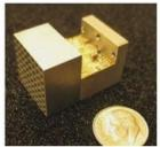
Non Lethal "repel" effect against personnel

SS-ADT on gimbaled skid plate



Hi-Flux Heat Exchanger Thermal SBIR

SIBR Topic A11-082



~1" Solid State Sub Module

3.2" 100 watt Modules (stack to size)

Schedule

Activities	FY12	FY13	FY14	FY15	FY16
• Fabricate/Assembly of Skid Plate (non gimbled)					
• Integration					
• Demonstrate "Repel" Effect					
• Gimbal Prototype					
• Skid Plate modification & integration					
• Human Effects Testing/Safety Release					
• Technical Test					
• Support TEC-D Demo					

Purpose:

Provide the Warfighter a Non-Lethal weapon system to enhance both base protection and mounted vehicle applications. SS-ADT will temporarily incapacitate personnel targets with reversible effects, without collateral damage, without adverse environmental impacts, and minimal risk of injury. SS-ADT is suitable for crowd control with the ability to stop, deter and turn back an advancing adversary, providing an alternative to lethal force.

Product:

- Integrated stand-a-lone system on a skid plate
- Tactical engagement range capable
- HECOE testing and demonstrations
- Safety release for Non-lethal operation

Payoff:

- Only Non-lethal system/technology that provides the Warfighter the full range capability of emerging requirements.
- Light weight, small footprint that is suitable for vehicle mounting or hard stand
- Force Protection – Basing

Report Documentation Page

Form Approved
OMB No. 0704-0188

1. REPORT DATE	2. REPORT TYPE	3. DATES COVERED
18 OCT 2012		**00-00-2012 to 00-00-2012**

4. TITLE AND SUBTITLE	5a. CONTRACT NUMBER
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	5c. PROGRAM ELEMENT NUMBER
6. AUTHOR(S)	5d. PROJECT NUMBER
	5e. TASK NUMBER
	5f. WORK UNIT NUMBER
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	11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release; distribution unlimited

13. SUPPLEMENTARY NOTES
Presented at the 2012 Science, Technology & Requirements Forum held 17-18 October in Fort Leonard Wood, MO.

14. ABSTRACT

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			
unclassified	**unclassified**	**unclassified**	**Same as Report (SAR)**	**5**	

Army SBIR Process

Topics → **Phase I** → **Phase II** → **Phase III**

4 years from topic generation to TRL 4/5 at end of Phase II

DoD Solicitation
Participation in all three annual solicitation periods. Topic selection very competitive across ARDEC.

Feasibility Study
$100K, 6 Months

$50K Option (Gap Funding)

~10% of proposals submitted selected

Prototype Development
$1M, 2 Years
($50K Option Gap Funding)
~50% invited proposals selected
Commercialization Pilot Program (CPP)
+
Ph II Enhancement
Competitive, additional PM SBIR $ with Agency contribution

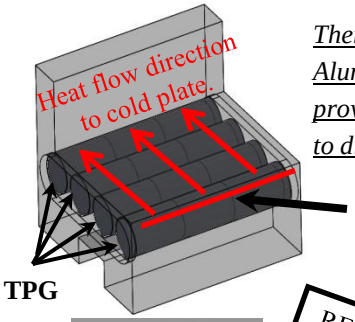
Commercialization
Transition to Federal Govt or Private Program

No SBIR Funds

Phase I + Option + Phase II = $1.15M
Phase II Enhancement = $500K+

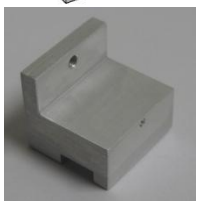
Backups

SBIR Topic # A11-082: "Novel Monolithic Microwave Integrated Circuit (MMIC) High Flux Heat Exchanger"



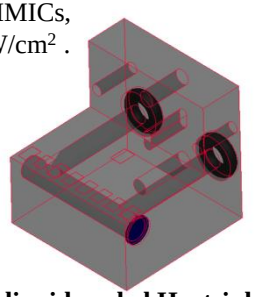
Thermal Pyrolytic Graphite embedded in Aluminum via Hot Isostatic Pressing provides a high thermal conductivity path to direct waste heat away from the MMICs.

Heat introduced along this edge by MMICs, 50 W at 210 W/cm^2 .



Passive Heatsink with TPG embedded. (No leak sources!)

REPLACES



Replaces liquid cooled Heatsink, with multiple leak sources.

	Phase I w/Option	Phase II
Start Date	October 30, 2011	October 2012 (TBC)
End Date	October 31, 2012	September 2014
TRL Level	3	6
IP and Comm. Partners	In patent process; Raytheon Partnering	Defining strategy & partners for commercialization
Major Milestone	Prototype Heatsink designed, analyzed, fabricated and successfully tested demonstrating feasibility.	High fidelity Heatsink designed, analyzed, fabricated and characterized for use in SS-ADT system.

The Peregrine Falcon Corporation, Pleasanton, CA

Purpose:

Reduce the size/weight/cost of advanced high power electronic weapon systems through advanced technologies for heat extraction at the microelectronics level (heat source).

Product:

- Application: Solid State Active Denial Technology (SS-ADT)
  - Challenge: liquid cooling – adds to weight/cube & reliability concerns (fluid leaks)
- SBIR Approach: embedded high conductivity Thermal Pyrolytic Graphite (TPG), removing all fluids in submodules and yielding a 90% reduction in o-ring connections
  - Deliverables:
    - High Fidelity M&S to refine TPG design (has already demonstrated a heat flux capability of 210 W/cm^2)
    - Hardware demonstrator & environmental/ruggedness, characterization & operating margin laboratory tests
    - Proof Sample for integration & validation with full electronics at ADT 'Module' level

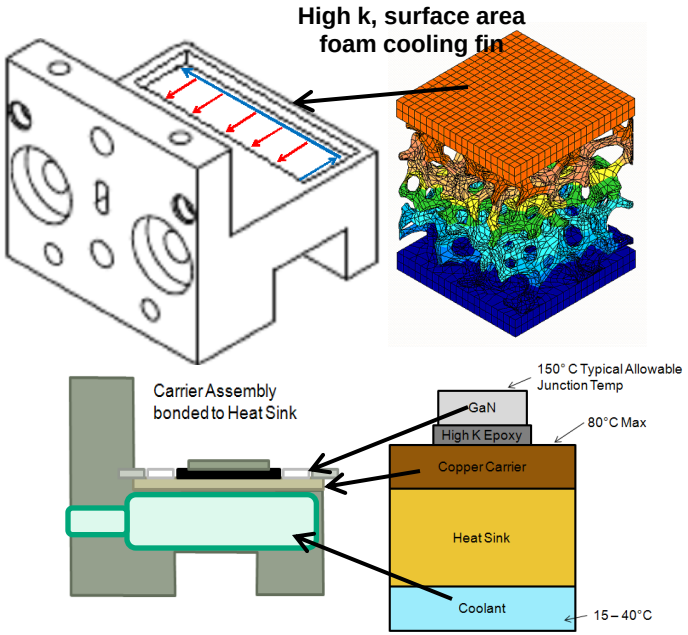
Performance Targets (achieved):

1. Removal of 50W waste heat of current MMIC/submodule design while operating at the worst-case maximum coolant operating temperature of 40°C
2. Carrier temperature held to 74°C (goal: 80°C max).
3. Demonstrated hot isostatic press fabrication requirements & full encapsulation

Payoff:

- Improved system reliability (eliminates 90% of fluid leak sources)
- Potential for reducing system/cube and a lowered Ready Power draw
- Technology well suited for leveraging into other Military & Commercial high power electronic system in need of high-flux heat transfer solutions

SBIR Topic # A11-082: "Novel Monolithic Microwave Integrated Circuit (MMIC) High Flux Heat Exchanger"



	Phase I	Phase I Option & Phase II	
Start	10/27/2011	8/15/2012	12/18/2012
End	04/30/2012	12/17/2012	12/18/2014
TRL	TRL 4	TRL 4-5	TRL 6
IP & Comm. Parters	Raytheon Partnering	Other Commercial partners	Utility Patent; Joint Dev. Agreement
Major Mile-stones	Performance targets demonstrated, single heat sink model	Higher fidelity laboratory testing; improved M&S	System integration & validation

Ultramet Corporation, Pacoima, CA,

Purpose:

Reduce the size/weight/cost of advanced high power electronic weapon systems through advanced technologies for heat extraction at the microelectronics level (heat source).

Product:

- Application: Solid State Active Denial Technology (SS-ADT)
  - Challenge: liquid cooling – adds to weight/cube & reliability concerns (fluid leaks)
- SBIR Approach: high conductivity metallicized foams to permit consideration of a system design change to air-based cooling
  - Deliverables:
    - M&S of approaches to support air-based cooling
    - Hardware demonstrator (environmental/ruggedness laboratory testing)
    - Hardware Proof Sample for integration & validation with full electronics at ADT 'Module' level

Performance Targets (achieved):

1. Maintained 60°C coolant ΔT, removing 50W waste heat of current MMIC/submodule design at air flow rate of 1.3 ft^3/min
2. Carrier temperature held to 79.8°C (goal: 80°C max).
3. Tested Copper and SiC foams in Phase I; higher conductivity potential using graphite foam planned for Phase II.

Payoff:

- Reduced system weight, system cube
- Improved system reliability (elimination of fluid & leaks)
- Technology well suited for leveraging into other Military & Commercial high power electronic system in need of high-flux heat transfer solutions